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### ***Upcoming Events:***

#### **Massachusetts Clean Cities Stakeholder Meeting, August 8, 2013, Pittsfield, MA.**

Berkshire Regional Transit Facility, 1 Columbus Ave.,  
Pittsfield, MA 02101. Contact Stephen Russell for  
more information (617-626-7325 or  
[stephen.russell@state.ma.us](mailto:stephen.russell@state.ma.us)).

#### **GSCCC Propane Workgroup Meeting, August 23, 2013, Concord.**

The GSCCC Propane workgroup works to remove barriers to the adoption of propane as a transportation fuel. The meeting will be held at 29 Hazen Drive at 1:00 pm on Friday August 23rd. Contact Dolores Rebolledo (603-271-6751, [dolores.rebolledo@des.nh.gov](mailto:dolores.rebolledo@des.nh.gov)) to learn more about the workgroup and to RSVP for the meeting.

#### **Northeast Diesel Collaborative 2013 Partnership Meeting, September 11-13, 2013, Groton, CT.**

Join us at the Mystic Marriott Hotel & Spa, 625 North Rd., Groton for an exciting program to discover and discuss the innovative technologies and strategies being used in the Northeast to reduce diesel emissions, improve efficiency, and promote cleaner and healthier communities. Hear about the latest clean diesel technologies, best business practices and funding opportunities. Keynote address by Allen Schaeffer,



Executive Director, Diesel Technology Forum.  
[Registration is free.](#)

**Mt. Washington Auto Road Alternative Energy Summit, September 14, 15, 2013, Gorham.** This event will showcase electric and hybrid-electric vehicles and sustainable energy sources. For more information visit:  
<http://mtwashingtonautoroad.com/news/alternative-energy-weekend-september-14th-15th-2013/>.

**Maine Clean Communities Stakeholder Meeting, September 17, 2013, Portland, ME.** 9:00-10:30 a.m. Contact Steve Linnell for details (207-774-9891 or [slinnell@gpcog.org](mailto:slinnell@gpcog.org)).

**Green Fleet Conference and Expo, October 1-2, 2013, Phoenix, AZ.** Click [here](#) for more information.

**GSCCC Quarterly Stakeholder Meeting, October 4, 2013, DES Offices, Concord.** 9:00-11:30 a.m. Mike Dunican of North American Equipment Upfitters will present on propane vehicle upfitting, and Glenn Johnson of AutoBeGreen will present on green automotive and small engine products.

**National Plug-in Day Celebration, October 5, 2013, Concord State House Plaza.** 8:30 a.m.-1:30 p.m. Celebrate electric and hybrid-electric vehicles! A variety of vehicles will be on exhibit - ride and drives too! Visit the farmers' market for refreshments - a perfect fall weekend day. More details to follow.

**AltWheels Fleet Day, October 7, 2013, Norwood, MA.** This event will be held at the Sheraton Four Points in Norwood and will feature panels, exhibits, vehicle displays, and ride and drives. Truly the largest meeting of corporate and municipal Fleet Managers on the East Coast. Co-sponsored by GSCCC. [To register.](#)

**CNG Cylinder Inspection Training Workshop, October 22-25, 2013, Nashua.** This sixteen hour course, held at Nashua Community College (9-1 pm, four days), will

prepare attendees for the national certification test. Space is limited. Contact Dolores Rebolledo (603.271.6751, [dolores.rebolledo@des.nh.gov](mailto:dolores.rebolledo@des.nh.gov)) if interested in taking this course.

**First Responder CNG, Propane and Hydrogen Vehicle Training, December 3, 2013, Concord.** This event will be held at the NH Fire Academy and registration is open to all first responders. Details to follow.

### ***News of Interest:***

***Clean Cities Technical Response Team Question of the Month:*** *What are the key terms to know when discussing natural gas vehicles (NGVs) and their fueling infrastructure?*

**Answer:** Becoming familiar with the terms below will help you better understand NGVs and the associated fueling infrastructure:

#### **Fuel Types**

- **Compressed Natural Gas (CNG):** CNG is a gaseous fuel stored in a cylinder on the vehicle at a high pressure (see "psi" below). It may be kept in the vehicle cylinder for long periods of time without venting. A CNG vehicle gets about the same fuel economy as a conventional gasoline vehicle on a gasoline gallon equivalent basis (see "GGE" below). CNG is used in light-, medium-, and heavy-duty vehicle applications.
- **Liquefied Natural Gas (LNG):** LNG is produced by super-cooling natural gas to negative 260°F in order to convert it to a liquid. The fuel is stored in a double-walled, vacuum-sealed pressure vessel. LNG is appropriate for trucks and other heavy-duty applications that require a long range because liquid is more dense than gas (CNG) and more energy can be stored by volume in the vehicle's tank. LNG stored in a vehicle will increase in temperature and pressure over time and vent; therefore, LNG should be used within a week or two of fueling.
- **Renewable Natural Gas (RNG):** Also known as biogas or biomethane, this emerging fuel source is derived from

decaying organic materials, such as waste from plants, landfills, wastewater, and livestock. After purification, RNG may be compressed or liquefied to fuel vehicles.

### **Vehicle Types**

**Natural Gas Vehicle (NGV):** There are three different types of NGVs available:

- **Dedicated Vehicle:** Dedicated vehicles are designed to run only on natural gas and are used in both light-duty and heavy-duty applications. In general, dedicated NGVs demonstrate better performance and have lower emissions than bi-fuel vehicles (see below).
- **Bi-fuel Vehicle:** These vehicles are able to run on either natural gas or gasoline because they have two separate fueling systems. Bi-fuel vehicles are typically light-duty models.
- **Dual-fuel Vehicle:** These vehicles are traditionally used in heavy-duty applications and have fuel systems that run on natural gas, but use diesel fuel as the source of ignition.

### **Fuel Measurement and Characteristics**

CNG and LNG may be measured in:

- **Gasoline Gallon Equivalents (GGE):** A unit of measure that represents the quantity of fuel that contains the same amount of energy as one gallon of gasoline. Measuring fuel in GGEs is a good way of comparing natural gas to gasoline, particularly when looking at fuel price or range. A GGE is equal to about 5.66 pounds of CNG and 1.55 gallons of LNG.\*
- **Diesel Gallon Equivalent (DGE):** A unit of measure that represents the quantity of fuel that contains the same amount of energy as one gallon of diesel. A DGE is equal to about 6.34 pounds of CNG and 1.72 gallons of LNG.\*

CNG is also measured in:

- **Cubic feet (ft<sup>3</sup>):** CNG is a gas, so it may be measured by volume. **MCF** represents 1,000 cubic feet.
- **Pounds (lbs.):** CNG may also be measured

in mass. *Approximately 21 cubic feet of CNG equals one pound.*

- LNG is also measured in **gallons**, much like gasoline or diesel.
- **Pounds per Square Inch (psi):** Psi is a measurement of the CNG pressure when it is delivered through the dispenser to a vehicle cylinder. CNG is typically stored onboard a vehicle at a pressure of 3,000 to 3,600 psi. The vehicle psi rating is important because it indicates the psi that the fuel system, vehicle cylinder, and the safety hardware are capable of handling safely.

### **Station Components**

CNG stations have the following components:

- **Compressor:** The device used to compress natural gas to a high pressure.
- **Storage Tank:** Once the gas is compressed, the CNG is moved to storage vessel(s) or tank(s) specially designed for the fuel.
- **Temperature Compensation:** The temperature of CNG is important because it affects the density and energy per unit volume of the fuel. At higher temperatures, CNG expands and becomes less dense, causing it to contain less energy per unit volume as it would at a lower temperature. The temperature compensation devices ensure that the CNG is delivered to the vehicle at the appropriate pressure in relationship to the ambient temperature.
- **Dispenser:** The device used to transfer CNG into a vehicle's tank. A typical CNG dispenser displays the pressure and temperature at which the tank is being filled and calculates the amount of fuel being delivered.

LNG stations also have storage tanks and dispensers, but do not require a compressor or temperature compensation devices.

### **CNG Infrastructure Types**

The following are two different types of CNG infrastructure:

- **Fast-fill:** Drivers fueling their vehicles at a fast-fill station can fill up in approximately the same amount of time as a conventional

vehicle at a gasoline or diesel station. This set-up is best suited for retail stations, where vehicles arrive in need of a quick fill, and CNG can be dispensed alongside gasoline or other fuel dispensers. Fast-fill stations receive low-pressure natural gas from the local utility line and employ a compressor on site. Once compressed, the CNG is stored at high pressures so it can be delivered quickly to a vehicle. As such, fast-fill stations may have smaller compressors but a larger storage capacity than time-fill stations.

- **Time-fill:** At a time-fill station, a vehicle may take several minutes to many hours to fill up; the time depends on the number of vehicles fueling, compressor size, and storage. Time-fill stations are typically used for fleets with central refueling locations or private stations that allow vehicles to fill up overnight. Time-fill stations can also work for smaller applications, such as residential fueling infrastructure. The natural gas is also drawn from a local utility line into a compressor on site. Time-fill stations may have larger compressors and the vehicles are generally filled directly from the compressor. Time-fill stations have an advantage over fast-fill stations in that their heat of recompression is less so that vehicles at these stations usually get a fuller tank of fuel than with fast-fill.

Additional information on natural gas production and distribution, NGVs, and natural gas infrastructure can be found on the Alternative Fuel Data Center website ([http://www.afdc.energy.gov/fuels/natural\\_gas.html](http://www.afdc.energy.gov/fuels/natural_gas.html)).

The NVGAmerica website also provides a wealth of information on natural gas and natural gas vehicles (<http://www.ngvc.org/>)

Clean Cities Technical Response Service Team  
[technicalresponse@icfi.com](mailto:technicalresponse@icfi.com)  
800-254-6735

\* The equivalency values provided here were calculated based on lower heating values for gasoline and diesel. These metrics vary across the country. The TRS encourages readers to contact their local gas provider and/or state weights and measures agency for the values used in their jurisdictions.

NH Department of Environmental Services

29 Hazen Drive

PO Box 95

Concord , New Hampshire 03302

This email was sent to: [dolores.rebolledo@des.nh.gov](mailto:dolores.rebolledo@des.nh.gov)

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